Modelling strangers

Modeling Strangers: Population size, fluidity, and complexity in shared cultural systems

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Languages are equal in their ability to convey complex meanings, but there is variation in their encoding complexity. There has been a mounting body of evidence that language complexity is shaped by social features of its population (Lupyan & Dale, 2010; Reali, Chater & Christiansen, 2018) However, the causal mechanisms and dynamics of this process are still open questions.

We present an agent-based model exploring how the arrival of new agents interacts with social network features to shape the complexity of a cultural system. We apply the model to language complexity, though the paradigm readily extends to other forms of cultural consensus (Baronchelli, 2018). A population of agents plays a variant of the regularity game (Cuskley, Kirby & Loreto, 2018), where shared rule paradigms emerge over successive paired interactions. Importantly, agents change their generalization strategy as they become more proficient, mirroring experimental findings (Cuskley et al., 2015). We manipulate population size, turnover rate, and network position of entering agents to examine how these affect the complexity of the emerging systems.

Results show that larger, more fluid populations result in simpler rule systems due to constant pressure from new learners. Languages also become simpler when new learners inhabit central nodes of a heterogeneous network. These results support the claim that less proficient learners may be one of the drivers of language simplification, but shows that the mechanisms underlying this involve dynamic interactions between population structure and growth. We argue that size, turnover rate, and network position of incoming agents influences cultural outcomes because these parameters effect overall information loss in a population (Spike, Stadler, Kirby & Smith, 2016). Our results emphasize the importance of information loss for shared conventional structure in culturally transmitted systems, providing a useful empirical frame for future experimental and observational approaches to examining complexity and consensus in cultural systems.

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